The Coal Situation

A quarterly review from Energy Economics — THE CHASE MANHATTAN BANK, N.A. NEW YORK, N.Y. 10081

Vol. 2 – No. 1
SEPTEMBER, 1981

STATUS OF U.S. COAL EXPORTS

Last year at this time it was difficult to find a domestic or international newspaper or trade journal that did not contain a major article dealing with the level of congestion at U.S. coal ports. The sudden appearance of record levels of coal demand had, at its peak, resulted in over 100 ships waiting at anchor for up to sixty days to load coal. The net effect was that in 1980, the United States was unable to obtain its full export potential. At the same time, the international consumer was forced to pay ship demurrage charges that increased the cost of coal delivered to his facilities. It has been estimated that in 1980, approximately 10 million tonnes of additional coal export would have been achieved if not for the inability to load and ship efficiently. As for the coal that was exported in the fall of 1980, the international consumer incurred demurrage charges ranging from US$5 to US$10 per tonne or more.

The first quarter of 1981 began like the close of 1980: record levels of coal demand, backlogs of ships at every U.S. port and the consumer grumbling about demurrage charges. Then, in March, came the United Mine Workers strike. As consumers reacted to diminished available supplies and a confusing outlook as to the length of the strike, ships were pulled from the ports. Press coverage shifted from the port to the mine as the strike dragged on into June.

Now, the strike has been over for three months; mines are at full production and coal is moving to the international markets. But an element seems to be missing: the heavy press coverage of congested ports. What has occurred in the six months to change a subject of high newsworthiness to one of little mention? Did the demand for U.S. coal disappear with the strike, or did the industry find a way to open new exporting facilities? The answers to these questions are discussed below.

U.S. Exports 1981 To Date

U.S. coal exports through the first seven months of 1981 continue to outpace the record levels established in 1980. As of the end of July, 48.2 million metric tonnes of coal had been shipped from the U.S. to foreign consumers, an increase of 5.1 million over the similar period in 1980. As shown in Table 1, 1980 monthly exports have been exceeded in 5 of the 7 months of reported statistics for 1981. The two exceptions are May and June, when deliveries were disrupted by the strike. Although the strike was in effect during the month of April, supplies in the distribution system were adequate to maintain shipments that, while lower than exports in the preceding month, exceeded deliveries in April of 1980. The interesting thing to note for May and June, however, is that despite the strike, almost 5.5 million tonnes of coal per month were shipped, quantities essentially equal to monthly shipments in April and May of 1979, a year unaffected by labor difficulties. In contrast, the 1978 strike, at its lowest, resulted in the almost complete cessation of exports.

TABLE 1
U.S. COAL EXPORTS JANUARY, 1979 THROUGH JULY, 1981
(Million Metric Tons)

	1979	1980	1981
January	3.3	4.0	5.3
February	2.5	3.7	6.1
March	4.2	5.1	8.8
April	4.8	6.9	7.5
May	5.6	7.8	5.5
June	5.4	8.1	5.4
July	5.7	7.5	9.6
August	5.7	8.4	–
September	4.7	7.6	–
October	6.9	8.6	–
November	5.6	8.2	–
December	5.7	7.5	–
TOTAL	60.1	83.4	48.2
Cumulative:			
January–July	31.5	43.1	48.2

Source: U.S. Department of Energy and National Coal Association

The ability to maintain high levels of exports despite the strike reflects the level of coal inventories within the distribution network, and the decline in the relative importance of union-produced coals to the international market.

Growing Importance of Steam Coal

Contributing to the relative decline in the importance of UMW-produced coal has been the growth in steam coal demands and the shift in sourcing of these coal supplies from the U.S.

Table 2 shows the breakdown of U.S. coal exports by type for the first seven months of 1979, 1980, and 1981. While cumulative exports in 1981 continue to exceed the 1979 levels in each category shown, steam coal trade shows the most healthy growth, with cumulative trade almost doubling for the second year in a row. In fact, 1981 monthly steam coal exports equaled or exceeded 1980 levels in each of the seven months for which data is avail-

able. Metallurgical trade, on the other hand, took the brunt of the strike effects. This situation reflects the fact that the United Mine Workers is a union whose rank and file are predominantly the underground coal miners of America. Most metallurgical coal is mined by underground methods, with large UMW representation. Steam coal, on the other hand, is principally surface mined with non-union or different union representation.

TABLE 2
CUMULATIVE (JANUARY THROUGH JULY)
U.S. COAL EXPORTS BY TYPE
(Million Metric Tons)

	BITUMINOUS COAL			
	Metallurgical	Steam	Other*	Total
1979	25.4	5.7	0.4	31.5
1980	31.1	11.0	1.0	43.1
1981	27.6	20.0	0.6	48.2

*Anthracite and Lignite

Source: U.S. Department of Energy and National Coal Association

As stated previously, the shift in sourcing of coal exports also contributed to the ability to continue the high levels of steam coal exports. Shown in Table 3 are the cumulative (January-July) coal exports by customs district for the years 1979, 1980, and 1981. As is clearly indicated, the 5-fold and 14-fold increase in coal exports through New Orleans and Los Angles/Long Beach, respectively, and the ability to maintain or increase slightly deliveries from other locations, more than offset the decline in exports from the Hampton Roads area, the major export point of Northern Appalachian metallurgical coals.

TABLE 3
CUMULATIVE U.S. COAL EXPORTS BY
CUSTOMS DISTRICT OF EXIT
(Million Metric Tons)

	JANUARY THROUGH JULY		
	1979	1980	1981
Hampton Roads	17.2	25.6	22.1
Baltimore	4.3	5.6	6.0
New Orleans	0.7	1.4	7.2
Los Angeles/ Long Beach	N/A	0.2	2.8
Mobile	0.7	1.1	1.4
Others[1]	8.6	9.2	8.7
TOTAL	31.5	43.1	48.2

[1]Includes Buffalo, NY, Detroit, MI, Charleston, SC, Port Arthur, TX, Duluth, MN, Great Falls, MT, Cleveland, OH, Wilmington, NC, New York, NY, Ogdensburg, NY, Pembrine, ND, Laredo, TX, El Paso, TX, Houston, TX, San Diego, CA, Nogales, AZ, Seattle, WA, Anchorage, AK, Tampa, FL, Savannah, GA.

Source: U.S. Department of Energy and National Coal Association

As with the growth in steam coal exports, the shift in the point of export has also diminished the impact of the UMW strike. In general, the largest and most militant portion of UMW representation is centered in Northern Appalachia (western Pennsylvania, West Virginia, etc.). With the source of coal through New Orleans and Los Angeles/Long Beach, the consumer was able to access coal supplies from regions less affected by the strike. It is interesting to note that although the shift in sourcing of coal was principally the result of congestion at east coast facilities, the consumer gained the added benefit of maintaining supplies during the protracted strike.

While providing the means to maintan the flow of coal during the strike, the increased movement of coal through non-traditional export points also contributed to relieving the congestion at east coast facilities experienced in the fall of 1980 and first quarter 1981. This is despite the fact that overseas shipments through July, 1981 exceeded deliveries in1980. Cumulative 1981 overseas shipments, as indicated by the subtotal line of Table 4, were 42.1 million tonnes through July, 1981, 7.1 million tonnes greater than 1980 and almost double the quantity shipped in July, 1979. The remaining 6.1 million tonnes of U.S. coal exports were shipped to Canada through the Great Lakes. It is noteworthy that overseas exports increased while supplies destined for Canada declined by 2.0 million tonnes. The principal source of Canadian exports is the unionized Northern Appalachia.

TABLE 4
CUMULATIVE U.S. COAL EXPORTS BY DESTINATION
(Million Metric Tons)

	JANUARY THROUGH JULY		
	1979	1980	1981
EEC	8.1	15.6	19.9
Other Europe	2.7	3.7	6.0
Japan	8.3	10.5	10.9
All Others	4.0	5.2	5.3
SUB-TOTAL	23.1	35.0	42.1
Canada	8.4	8.1	6.1
TOTAL	31.5	43.1	48.2

Source: U.S. Department of Energy and National Coal Association

Outlook For the Rest Of 1981

Despite the protracted United Mines Workers strike, the growing international demand for steam coal, coupled with the sourcing of their supplies from areas with more stable labor forces and through alternative coal loading points, have produced a trend in coal exports that if continued will will result in another record year for U.S. coal exports. But will the level of trade registered through the first 7 months be maintained? The factual and anecdotal evidence supports an affirmative answer.

First, while a protion of the U.S. coal exports in late 1980 and early 1981 were undoubtedly for stockpile build-up in anticipation of the miners' strike, the pattern of trade begun back in March, 1980 supports a monthly pattern of exports in the 8 million tonnes range.

Second, while the strike had an across-the-board effect on trade, overseas shipments were maintained at levels which would, in and by themselves, not produce a need to rebuild consumer stocks, and yet July shipments rebounded significantly.

Third, steam coal trade went on unabated during the strike, strongly indicating an underlying new base level for steam coal trade.

Fourth, European consumers continue to experience extreme disruption of Polish coal supplies, a situation not expected to be relieved this year or next. While the U.S. coal suppliers have benefitted from the situation in Poland, the surge in U.S. exports and exports from other locations exceeds the loss from Poland. Once again, this supports the idea that a new base level of coal demand has been established.

Finally, while the strength of the U.S. dollar will tend to make alternative supplies of coal cheaper, the inter-

national consumer is somewhat limited in his capability to shift supply sources. Of course, the dollar has weakened of late.

These considerations lead to the conclusion that the U.S. will experience another record year for international coal trade, with total exports reaching 87.5 million tonnes by the close of 1981. Simultaneously, the expansion of exporting facilities coupled with alteration of policies covering vessel registration and loading procedures at the major U.S. east coast ports will continue to alleviate the massive congestion of vessels in U.S. ports. In short, the only thing that has changed for U.S. coal exports since 1980 is that the market place has adapted swiftly, thus reducing the news attractiveness of the problems experienced in 1980.

But there is important news for 1981, news of solution, not problem. Coal exports are alive and well. They are healthy because of the major strength of the U.S. system: its ability to adapt and adopt solutions quickly. Almost overnight, ports and loading procedures have been expanded and improved, a process that is difficult if not impossible to accomplish anywhere else. More important, however, the indications are that the fear the industry had that a protracted strike would adversely affect future overseas market opportunities may have been unfounded. In fact, the strike may have expanded opportunities by strengthening the consumers' willingness to shift to alternative points of export such as Los Angeles/Long Beach and New Orleans, thus opening up market opportunities for coal producers in areas other than the Appalachian region.

Vincent J. Calarco, Jr.

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(over)

Below, we provide the Table of Contents of the study, which indicates the specific topics under discussion. The study is available at $75 (U.S.), payable by check or money order, to The Chase Manhattan Bank, N.A.

World Coal Outlook to the Year 2000: Opportunities and Uncertainties

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The Coal Situation

Vol. 2 – No. 2
DECEMBER, 1981

STATUS OF EUROPEAN COAL STOCKS

In the last issue of *The Coal Situation* we reported on the record pace of U.S. coal trade through the first seven months of 1981. In that period, the U.S. coal industry exported 48.2 million metric tons (tonnes) of coal, 5 million tonnes (11.6 percent) more than the quantity exported during the first seven months of 1980. Over the balance of the year, the pace of U.S. coal exports has accelerated, with an estimated 52.1 million tonnes exported in the last five months of 1981. Thus, for the second year in a row, the U.S. has established a new record in coal exports, with a total of 101.7 million tonnes traded in 1981, 18.3 million tonnes (21.9 percent) greater than 1980 exports.

The majority of the growth in U.S. coal exports resulted from the increased shipment of steam coal, up 15.8 million tonnes over the 1980 total of 24.3 million. The major portion of this incremental growth reflects an increased demand for U.S. thermal coal from Western European consumers, a situation reflecting the replacement of lost Polish coal supplies and the increased economic attractiveness of coal versus oil and natural gas in applications such as electric power generation. As of this writing, it appears unlikely that there will be any appreciable change this year in the availability of coal from Poland that would significantly reduce the level of exports from the U.S. and other exporting nations.

There have been, however, a growing number of reports on an accumulation of large quantities of coal stockpiles in Europe during 1981, a situation that will have a direct bearing on the outlook for international trade in 1982 for all exporters. In fact, France's state coal importing agent, Association Technique de l'Importation Charbonniere (ATIC) announced in December that, as a result of a large coal stockpile build-up in 1981, France would be reducing its imports of coal in 1982 by 4 to 5 million tonnes.

The purpose of this issue of *The Coal Situation* is to examine the current level of coal stocks in Europe and their potential impact on coal trade. Unlike the oil market analyst, for whom consistent statistics on production, trade, and consumption are collected daily and reported in great detail, the analyst dealing in coal is limited by the lack of detailed, timely statistics. Thus, this analysis will be confined to the current stock situation of the European Economic Community and its member nations.

EEC–9* Coal Stock Levels

The level of the EEC–9's coal stocks and the number of days of supply they provide are shown in Table 1. The stock levels represent closing stocks at year-end 1979 and 1980, and closing stocks as of August, 1981. The "days supply" indicates the number of days of consumption or production the closing stocks would maintain at the average daily rate of production or consumption as appropriate for the years 1979 and 1980, and for the first eight months of 1981. The "days supply" indicated for colliery hard coal stocks and coking plant coke stocks represents the number of days based on the average daily mine production and average daily coke production. The "days supply" for public power stations and hard coal at coking plants is based on the Community's average daily consumption of hard coal (bituminous and anthracite) in these applications.

From the standpoint of metallurgical coal supplies, with stocks essentially unchanged, it would appear that the Community has adapted to the deterioration of its steel production

*The EEC-9 refers to: West Germany, France, Italy, Belgium, Luxembourg, the Netherlands, Denmark, Ireland, and the United Kingdom. While Greece is now included in the EEC, its use of coal and levels of stock are not included in this analysis.

TABLE 1

EEC-9 CLOSING COAL STOCKS

	Hard Coal [c]						Hard Coke	
	Colliery Stocks		Public Power Stations		Coking Plants		Coking Plants	
Year	1000 Tonnes	Days Supply	1000 Tonnes	Days Supply	1000 Tonnes	Days Supply	1000 Tonnes	Days Supply
1979	26,497	41	32,829	77	4,912	20	9,889	54
1980	37,202	55	39,576	88	4,868	20	10,708	59
August 1981	44,627	68	46,213[b]	110	4,997[a]	22	10,340	59

[a] Closing Stocks June, 1981.
[b] Estimated.
[c] Anthracite and Bituminous Coal.

SOURCE: Eurostat, "Coal Monthly Bulletin" and "Electrical Energy Monthly Bulletin."

during the last two years. This conclusion, however, masks the impact that declining steel production has had on stock levels at Community mines, particularly in West Germany, France, and the U.K.

As is shown in Table 1, colliery hard coal stocks, that is, coal at Community mines, have increased from 26.5 million tonnes at the close of 1979 to 44.6 million at the end of August, 1981. Given this increase, as well as the slight decline in the Community's hard coal production, the number of days of production these stocks represent has increased from 41 days of average daily production in 1979 to 68 days for the first eight months of 1981.

The build-up in colliery stocks has occurred in three countries, West Germany, France, and the United Kingdom (not shown), with the majority occurring in France and the U.K. Germany's build-up reflects a fall-off in the trade of metallurgical coal with its European partners and lower shipments to domestic consumers. At the close of August, stocks at France's coal mines represented 134 days of average daily production versus a 75–day stock at the close of 1979. The United Kingdom has also experienced a significant increase in coal stocks, from 31 days in 1979 to 65 days of colliery stocks at the end of August, 1981.

In addition to the build-up of stocks at the mines, the Community also experienced a net increase in the level of stocks at its public power stations. Closing stocks at the Community's public power plants increased from 77 days of average daily consumption in 1979 to 88 days in 1980, reaching 110 days in August, 1981. While August is the normal seasonal high point for Community power plant coal stocks as they prepare for their peak period of consumption in the winter, stocks at the close of August, 1981 were substantially higher than at the close of August, 1980.

Table 2 shows the days supply of hard coal stocks at public power stations for the major coal consuming members of the Community, the stock levels as of month-end August, 1981, and the net change in stocks between August, 1980 and August, 1981.

There are two significant points to be noted about the information provided in Table 2. The first is the obvious diversity in the days supply levels maintained within the Community, from the very high levels held by Denmark to the relatively low levels, on average, maintained by Italy.

The second point is the level of stock build-up between 1979 and August, 1981, with the most significant increases being experienced by Denmark and France. As of August, 1981, Denmark's days supply had more than doubled to 362 days of average daily consumption for the first eight months of 1981, with total stocks increasing by over 2.2 million tonnes (62.8 percent) between August, 1980 and August, 1981. In the case of France, the public power stations' August-to-August stocks increased by over 1.4 million tonnes (26 percent increase), with days supply increasing by 70 percent from year-end 1980 to stand at 179 days at the end of August.

Reasons Behind European Stock Build-ups

There are three basic reasons for the stock build-up by the Community's electric utility industry. First, there was the conscious effort to build stocks to reflect a perceived higher level of risks of future supply disruption. The Community has experienced disruption of coal supplies from Poland, lengthy labor strikes in the U.S., disruption by labor of coal exports from Australia, and the ever-present concern over South Africa, all during a period of increasing dependence upon imported coal. The higher perceived risks of supply disruptions due to these experiences have quite naturally led to higher desired stocks and days supply levels.

Second, stocks may be increasing relative to consumption due to the receipt of coal at new power stations that are either not yet on line or not at full capacity. Currently, we do not have enough information to assess the magnitude of the contribution this second consideration has made to the stock build-up shown in Table 2.

Finally, there is the involuntary build-up in stocks that results from recession. In the case of the Community's electric utilities, recession has induced lower electricity demand and production which, when coupled with the addition of new nuclear plants and contractual commitments for coal purchases, have produced a net increase in the level of coal stocks.

As shown in Table 3, recession has had a major effect on the rate of electricity production by the Community. With the exception of France, all members of the Community have experienced a net decline in electricity production in the first eight months of 1981 relative to 1980. It should be noted here that the dramatic decline in Denmark's production of electricity was offset by a dramatic increase in its imports of electricity from other ECC members. Simultaneous with this decline in electricity production has been the addition of a significant quantity of new nuclear capacity, principally in West Germany and France. The combined effect of these two factors was a decline in the quantity of electricity generated by fossil fuels

TABLE 2

DAYS SUPPLY AND STOCKS OF HARD COAL STOCKS AT PUBLIC POWER STATIONS BY EUROPEAN COUNTRY

	West Germany	France	Italy	Netherlands	Belgium	United Kingdom	Denmark	EEC-9
Days Supply								
1979	82	84	31	153	59	67	203	77
1980	113	106	21	22	58	76	157	88
August 1981	129*	179	54	62	55	81	362*	110*
Stocks-1000 Tons								
August 1981	12,500*	6,832	815	525	879	18,668	6,000*	46,219*
Net Change 8-80 to 8-81	1,693*	1,419	315	293	188	1,007	2,283	7,198*

*Estimated

SOURCE: EUROSTAT, "Electrical Energy Monthly Bulletin."

in conventional thermal plants. While this fall-off in conventional thermal power generation has been most heavily weighted toward the decreased use of oil and natural gas, the use of hard coals has also been affected.

TABLE 3

1980 TO 1981 (JANUARY – AUGUST)
ELECTRICITY PRODUCTION
GROWTH RATES BY EUROPEAN COUNTRY
(PERCENT PER YEAR)

	Nuclear	Hydroelectric	Conventional Thermal	Total
West Germany	31.1	–0.7	– 5.2	– 0.7
France	83.3	–0.7	–23.6	7.4
Italy	– 8.2	–6.8	– 0.8	– 2.6
Netherlands	–23.1	NONE	– 0.6	– 2.1
Belgium	2.9	33.0	–11.8	– 7.7
United Kingdom	5.3	19.0	– 5.7	– 3.9
Denmark	NONE	NONE	–34.7	–34.7
EEC-9	40.2	–1.6	– 7.8	– 1.1

SOURCE: Eurostat, "Electrical Energy Monthly Bulletin."

Table 4 shows the growth in fuel consumption by the Community's public power plants. The "Other" column includes energy consumed in the form of lignite, oil products, natural gas, and derived gas. In the case of lignite, the Community's consumption has increased slightly in 1981, so that the decline shown for the "Other" category represents a decline in the use of oil and natural gas. As is clearly shown in Table 4, each member of the Community has reduced its use of oil and gas in generating electricity. But there has been a simultaneous decrease in coal consumption by France, Denmark, and the U.K. The other countries increased their use of coal for power generation during the first eight months of 1981. The key point here, however, is that the consumption of hard coals by all of these nations would have been higher, particularly in the summer months, if not for the decline in electric power demand produced by recession.

TABLE 4

1980 TO 1981 (JANUARY – AUGUST)
PUBLIC POWER PLANT FUEL CONSUMPTION
GROWTH RATES BY EUROPEAN COUNTRY
(PERCENT BY YEAR)

	Hard Coal	Others	Total
West Germany	13.8	–14.4	– 4.3
France	–18.1	–12.4	–15.3
Italy	19.6	– 2.6	0.1
Netherlands	31.0	– 3.8	0.7
Belgium	12.7	–12.7	–11.0
United Kingdom	– 4.6	–31.0	– 7.8
Denmark	–25.8	–54.1	–31.7
EEC-9	– 1.0	– 7.9	– 1.0

SOURCE: Eurostat, "Electrical Energy Monthly Bulletin."

Conclusions and Implications

The data that is available clearly indicates that there has been a significant build-up in coal stocks within the key coal consuming countries of the European Economic Community, a situation reflecting both the impact of recession and an increase in the consumers' desired levels of stocks. Although corroborating information is not available, it is not unreasonable to assume that similar conditions hold throughout Europe.

As has been announced in France, the current levels of stocks elsewhere in Europe will undoubtedly have an impact on the level of coal trade in 1982. The impact, however, will be tempered by both the rate of economic recovery in the individual nations and by the stock policies established to guard against supply disruptions. For instance, in the last few years, the U.S. utilities, having experienced extended mine worker and rail strikes, have been maintaining coal stocks greater than those indicated in Table 2. Closing hard coal stocks at U.S. utilities in 1979 stood at 117 days of average daily consumption. As of August, 1981, following the protracted United Mine Workers strike, stocks at U.S. utilities stood at 90 days of average daily consumption.

The next issue of *The Coal Situation*, due in March, will examine the expectations for coal trade in 1982.

Vincent J. Calarco, Jr.

UNITED STATES COAL BALANCES

	– – – – APRIL THRU JUNE – – – –			– CALENDAR YEAR TO DATE –		
	1981	1980	CHANGE	1981	1980	CHANGE
	Million Short Tons		–%–	Million Short Tons		–%–
Consumption						
Electric Utilities	138.66	127.98	8.35	289.33	272.55	6.16
Coking Plants	13.58	17.70	–23.28	29.75	36.48	–18.45
General Industry	14.84	14.69	1.02	32.84	31.23	5.16
Retail Deliveries	1.23	1.20	2.50	3.12	3.36	– 7.14
Total Domestic Demand	168.32	161.57	4.18	355.05	343.62	3.33
Exports	20.52	25.06	–18.12	42.80	39.19	9.21
Total Demand	188.83	186.63	1.18	397.84	382.81	3.93
Supply						
Domestic Production	135.96	212.04	35.88	349.48	418.13	–16.42
Imports	0.30	0.37	–18.92	0.52	0.78	–33.33
Total New Supply	136.26	212.41	–35.85	350.00	418.91	–16.45
Stock Change	–52.57	25.79	–	–47.84	36.11	–

Totals may not add due to rounding

Sources: U.S. Department of Energy
National Coal Association
Chase Manhattan Bank

EUROPEAN ECONOMIC COMMUNITY COAL BALANCES – HARD COAL

	APRIL THRU JUNE			CALENDAR YEAR TO DATE		
	1981	1980	CHANGE –%–	1981	1980	CHANGE –%–
	Million Short Tons			Million Short Tons		
Deliveries to:						
Electric Utilities	48.73	48.52	0.43	98.58	99.01	– 0.43
Coke Plants	22.41	25.29	–11.39	45.63	48.99	– 6.86
General Industry	6.38	5.77	10.57	12.47	11.87	5.05
Retail Deliveries	4.01	4.66	–13.95	9.02	10.43	–13.52
Total Domestic Demand	81.53	84.25	– 3.23	165.69	170.31	– 2.71
Exports–Third-Party Country	0.94*	0.20	370.00	1.76	0.59	198.31
Total Demand	82.47	84.44	– 2.33	167.45	170.89	– 2.01
Supply						
Domestic Production	66.37	66.02	0.53	138.06	139.42	– 0.98
Imports (Third-Party Countries)	19.97*	21.67	– 7.85	37.17*	40.06	– 4.72
Total New Supply	86.34	87.69	– 1.54	176.23*	179.48	– 1.81
Stock Change	3.87	3.24	–	8.78	8.58	–

Totals may not add due to rounding
*Estimated

Sources: Eurostat
Chase Manhattan Bank

CHASE

The Coal Situation

B1900-5 4/12/82

Vol. 2 – No. 3
MARCH, 1982

International Coal Trade – 1982

Sluggish growth of world economies, excess consumer stock build-ups in 1981, and declining world oil prices: these are the three factors the combined effect of which is producing a slowdown in the growth rate of world steam coal trade in 1982.

This year, the international trade in steam coal is forecasted to reach 135 million metric tons (tonnes), an increase of 3.8 percent over the 1981 volume. While significantly lower than the 15.9 percent increase in 1980 and the 12.4 percent increase of 1981, the reduced growth rate expected in 1982 should not be interpreted as a signal of the collapse of the international steam coal market. Even with adjustments to reflect the factors noted above, the market is expected to continue to achieve growth rates consistent with our previously expressed long-term expectations.

While the rate of growth in steam coal trade is expected to soften in 1982, metallurgical coal trade is projected to recover from the decline experienced in 1981, with an increase of 7.3 million tonnes over 1981 trade volume. Overall, international trade in coal is forecasted to reach 284.1 million tonnes, 4.5 percent greater than 1981 trade volume.

The purpose of this issue of *The Coal Situation* is to present our forecast of 1982 international coal trade. We begin with a review of the experience of the international markets in 1981 and conclude with an examination of the pattern of trade expected for 1982.

Review of 1981

An estimated 271.9 million tonnes of coal were traded internationally in 1981, an increase of 5.3 percent (13.8 million tonnes) over the revised statistics for 1980. While showing only slightly more than half of the 10 percent increase experienced in 1980 (258.1 million tonnes in 1980 versus 234.6 million tonnes in 1979), 1981 was a surprisingly good year for coal imports, given the breadth of the world recession and its impact on steel production, industrial activity, and electricity demand.

As anticipated, the decline in world raw steel production resulted in a fall-off in the level of metallurgical coal imports in 1981. The decline was a very modest 0.4 percent worldwide (141.8 million tonnes in 1981 versus 142.4 million tonnes in 1980), but these statistics mask the increased imports by a very few countries, most notably Japan, without which the decline would have been much deeper. For instance, excluding Japan's metallurgical coal imports of 62.3 million tonnes in 1980 and 64.7 million tonnes in 1981, imports by the rest of the world declined by 4.1 percent (3.3 million tonnes) between 1980 and 1981.

Japan's increased importation of metallurgical coal in 1981, despite an 8.7 percent decline in its production of steel, attests to the speed at which this nation adapts its manufacturing process to changes in the relative economics of its raw material inputs. In the case of steel making, the rapid escalation of the costs of imported oil relative to coal has resulted in the replacement of oil with coke in blast furnace injection. In response to high oil prices, the Japanese steel industry almost halved its per unit of output use of oil in 1980 and again in 1981.

While international trade in metallurgical coal remained in the doldrums, steam coal imports continued strong in 1981. Despite the recession-induced impacts of lower industrial activity and lower or negative growth in electricity demand concurrent with the addition of new nuclear generating capacity, world steam coal imports increased by 12.4 percent (14.4 million tonnes) in 1981. As with metallurgical coal, Japan was the primary growth market, doubling, with an additional six million tonnes, the volume of steam coal it imported compared to the previous year. Unlike metallurgical coal importing nations, however, the nations increasing their imports in 1981 were not a select group. Last year, almost every nation that imports steam coal increased its volume.

While the high level of imports in 1980, and expectations of recession or, at best, sluggish economic growth in 1981, might have been expected to slow and, in some instances, reverse the rate of growth in steam coal trade for 1981, the carry-over of consumer response to the oil price shocks of 1979 and 1980 maintained the momentum in coal imports experienced in 1980. The response to even higher oil prices has been most pronounced in the world cement industry. Beginning in 1980, and in earnest in 1981, the cement industry undertook the conversion of its kilns from oil-fired to coal-fired operation. Along with the additional coal demand created by the cement industry conversions were the continued heavy international purchases by electric utility and other industrial consumers. The absolute level of imports by these two groups of consumers, however, exceeded the quantity needed to fulfill their eventual consumption needs, particularly in Western Europe. As a result, consumer stocks in Europe increased, as was discussed in some detail in the December *Coal Situation*.

On the exporting side, the principal benefactors of the increased demand for coal in 1981 were the United States, Australia, and the United Kingdom. In 1981, coal exports (including anthracite) by the United States increased by 18.9 million tonnes (22.7 percent), while Australia was up 8.2 million tonnes (19.2 percent), and the United Kingdom 5.3 million tonnes (139.5 percent). While all three nations benefitted from the expansion in international coal demand, the growth experienced by the U.S. and U.K. was further affected by the fall-off in the availability of Polish and Soviet coal supplies.

The 15 million tonnes of coal Poland was able to export in 1981 was less than half the quantity it exported in 1980, and only slightly more than one-third of the peak exports of 41.4 million tonnes achieved in 1979. As for the Soviets, although total exports in 1981 are estimated to have fallen by 15 percent (3.6 million tonnes), this decline was almost entirely the result of a decline in exports to western countries, in particular Western Europe. Consumers turned mostly to the U.S. and the U.K. to fill the void created by the decline in Polish and Soviet coal exports.

Outlook for 1982 Imports

Three factors will influence the level of international coal trade in 1982. First is the timing and magnitude of the recovery of the world economies. In the case of metallurgical coal trade, the modest recovery expected for steel production, particularly in Western Europe, is most significant. For steam coal trade, increased electricity demand and higher industrial activity accompanying the expected economic recovery are the most important aspects.

The second factor influencing 1982 coal trade is the build-up in consumer stocks that occurred in 1981. As mentioned above, the principal locations of the net increase in coal inventories were the power plants in Western Europe. This build-up is partially explained by the desire on the part of utilities to increase inventories in the light of their growing dependence on imports and a perceived higher level of risk of future supply disruptions. A portion of the build-up, however, was involuntary – the result of recession and lower than anticipated electricity demand. During 1982, the consumer will be making a conscious effort to work off such excess inventories. The most notable countries facing this situation are France, Germany, and Denmark.

The stock situation for metallurgical coal, with the exception of a build-up in colliery (mine) stocks by the U.K. and Germany, is well in hand. Consumers' metallurgical stocks remained unchanged in 1981. As a result, any increase in metallurgical coal requirements by the importers of the world would necessitate increased imports. The one exception is Japan, which is using its stocks as a bargaining tool in its current contract renegotiations with its U.S. and Australian metallurgical coal suppliers.

The final element influencing the level of coal trade in 1982 is the price of oil. Recently announced price cuts for oil and indications of further declines will result in a re-examination of the coal/oil competitive position by those consumers who have been contemplating conversion or displacement of oil but have not fully implemented such plans. When these re-examinations are completed, consumers who had a clear-cut advantage in going to coal before the price cuts will find that although pay-back periods have lengthened, the economics and uncertainties of oil will continue to favor coal over the long run. Consumers for whom the coal/oil trade-offs were marginal, and who were hesitant, therefore, to make a coal commitment, will not proceed. The net effect will be a delay in the use of coal by this segment of the market in 1982, with recovery thereafter.

The overall effect of the three factors outlined above is a projected 4.5 percent increase in coal trade in 1982, with total imports reaching 284.1 million tonnes. With the exception of the European Economic Community (EEC), every importing region of the world is expected to increase its coal imports in 1982. During the year, the most significant growth markets will be Japan, Korea, Taiwan, Spain, and the Eastern European countries. This year's imports by the EEC are projected to decline, the net effect of expected sluggish economic growth and the excess steam coal stocks discussed above.

As a result of the forecasted decline in EEC imports of steam coal and slower rates of expansion elsewhere, the overall growth in steam coal trade in 1982 will slow relative to the experiences of 1980 and 1981. As indicated at the outset, while worldwide steam coal imports increased by 15.9 percent in 1980 and by 12.4 percent in 1981, the growth rate for 1982 is projected to be 3.8 percent, with total volume reaching 135.0 million tonnes.

While the EEC's total steam coal imports are expected to decline relative to the experience of 1981, imports of metallurgical coal are projected to increase. Together, the modest recovery of the EEC steel industry, the recovery of the Brazilian market, expansion by Japan, Korea, and Taiwan, and the need by Eastern European nations to replace Polish supplies will result in a projected increase of 7.3 million tonnes (5.1 percent) in 1982 metallurgical coal imports.

Coal Exports in 1982

In terms of the suppliers' responses to world import requirements, the most significant event to occur in 1982 may well be Poland's ability to increase its export of coal and the resulting impact on U.S. and U.K. exports to Western Europe.

As a result of martial law and the return to a six-day work week, Polish hard coal production has increased to a level at which additional exports can be made in 1982. While the absolute level of additional Polish exports is extremely uncertain due to the situation in Poland, from the point of view of the U.S.- and U.K.-based suppliers it is prudent to assume Poland comes back fairly strongly. On this basis, it may be assumed that Poland will be capable of exporting 24 million tonnes of coal in 1982, 9 million tonnes more than in 1981. It may further be assumed that because of its need for hard currency, the majority of these additional supplies will go to Poland's western trading partners, with the EEC and the rest of Western Europe the largest recipients.

The net effect of these assumptions concerning Poland and the fall-off in the EEC's steam coal imports is a projected decline of 4 to 5 million tonnes in U.S. trade with Western Europe, while the U.K. loses 1 to 2 million tonnes. Should the U.K. respond with major price concessions, its losses to Poland would shift to the U.S. For the U.S., the decline in trade with the EEC and Western Europe will be partially offset by additional trade with other countries, the most significant being the Eastern Bloc nations.

Summary

The 1981 world coal trade experience and our expectations for 1982 are summarized in Table 1. While total trade this year is expected to increase by 4.5 percent, this growth is the net result of a recovery in the trade of metallurgical coal and a slowing of the rate of expansion of steam coal trade. While the growth in steam coal trade in 1982 is significantly lower than that of 1980 and 1981, it is not felt to be an early warning of the collapse of the international coal market. In fact, 1982 coal trade prospects appear to be in line with our views regarding the long-term prospects for coal as detailed in our publication, "World Coal Outlook to the Year 2000: Opportunities and Uncertainties."

Vincent J. Calarco, Jr.
Vice President

TABLE 1

WORLD COAL TRADE

(Million Metric Tons)

	Metallurgical Coal			Steam Coal			Total		
	1980(R)	1981(E)	1982	1980(R)	1981(E)	1982	1980(R)	1981(E)	1982
EXPORTERS									
U.S.	57.3	59.3	60.5	25.9	42.8	37.4	83.2	102.1	97.9
Australia	35.1	40.8	42.5	7.7	10.2	15.0	42.8	51.0	57.5
South Africa	2.2	2.0	2.0	27.0	27.2	27.4	29.2	29.2	29.4
W. Germany	7.6	7.0	7.6	4.1	5.8	5.0	11.7	12.8	12.6
Canada	13.8	13.9	14.2	1.5	1.7	1.8	15.3	15.6	16.0
Other	6.4	6.3	7.3	12.4	17.9	17.4	19.0	24.2	24.7
Sub-Total	122.4	129.3	134.1	78.8	105.6	104.0	201.2	234.9	238.1
Poland	6.4	2.5	5.0	24.9	12.5	19.0	31.3	15.0	24.0
USSR	13.6	10.0	10.0	12.0	12.0	12.0	25.6	22.0	22.0
Total	142.4	141.8	149.1	115.7	130.1	135.0	258.1	271.9	284.1
IMPORTERS									
N. America	5.9	5.3	5.9	11.3	12.2	12.5	17.2	17.5	18.4
Latin America	5.8	5.2	6.3	0.7	0.8	0.8	6.5	6.0	7.1
EEC	32.0	29.1	30.6	59.7	61.4	57.3	91.7	90.5	87.9
Other W. Europe	12.7	12.2	12.7	7.1	10.9	12.1	19.8	23.1	24.8
Eastern Europe	12.7	12.1	13.6	21.0	20.4	22.0	33.7	32.5	35.6
Japan	62.3	65.8	66.4	6.3	12.5	15.5	68.6	78.3	81.9
Other	11.0	12.1	13.6	9.6	11.9	14.8	20.6	24.0	28.4
Total	142.4	141.8	149.1	115.7	130.1	135.0	258.1	271.9	284.1

(R) Revised
(E) Estimated

Copies of "The World Coal Outlook" are still available. We provide below a brief description and an order blank, also featuring Chase's other energy studies.

World Coal Outlook to the Year 2000: Opportunities and Uncertainties

This 50-page report on the outlook for coal provides in more detail the results of one component of an integrated, multi-disciplinary assessment of the world energy markets conducted by Energy Economics Division. The report includes detailed regional forecasts of coal demand by end-use application. Regions include the U.S., Canada, Western Europe, Japan, Other Asia, Latin America, Africa, Australia/New Zealand, and the Communist Bloc. In addition, regional coal production forecasts are provided, with a detailed analysis of regional coal trade patterns. The assessment of coal trade includes a separate analysis of trade in metallurgical and thermal coals. The study concludes with an analysis of the level of seaborne coal trade and the availability of ports to support projected levels of international trade. Forecasts based on alternative scenarios provide an assessment of the opportunities and risks associated with future coal demand. Included in this analysis are the potential impacts of the rate of nuclear power development, speed of industrial coal conversion, rate of steel industry growth, and the growth in synthetic fuel production.

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UNITED STATES COAL BALANCES

	JULY THRU SEPT.			CALENDAR YEAR TO DATE		
	1981	1980	CHANGE	1981	1980	CHANGE
	Million Short Tons		-%-	Million Short Tons		-%-
Consumption						
Electric Utilities	158.96	154.78	2.70	448.29	427.33	4.90
Coking Plants	16.19	14.58	11.04	45.94	51.06	-10.03
General Industry	15.35	12.73	20.58	48.19	43.96	9.62
Retail Deliveries	1.34	1.09	22.94	4.46	4.45	0.22
Total Domestic Demand	191.84	183.18	4.73	546.89	526.80	3.81
Exports	33.98	25.88	31.30	76.78	65.02	18.00
Total Demand	225.82	209.06	8.02	623.66	591.87	5.37
Supply						
Domestic Production	230.93	198.51	16.33	580.41	616.64	-5.88
Imports	0.23	0.20	15.00	0.75	0.98	-23.47
Total New Supply	231.16	198.71	16.33	581.16	617.62	-5.90
Stock Change	5.35	-10.35	-	-42.49	25.76	-

Totals may not add due to rounding

Sources: U.S. Department of Energy
National Coal Association
Chase Manhattan Bank

EUROPEAN ECONOMIC COMMUNITY COAL BALANCES – HARD COAL

	JULY THRU SEPT.			CALENDAR YEAR TO DATE		
	1981	1980	CHANGE	1981	1980	CHANGE
	Million Short Tons		-%-	Million Short Tons		-%-
Deliveries to:						
Electric Utilities	44.67	46.55	-4.04	143.25	145.56	-1.59
Coke Plants	23.31	24.56	-5.09	68.94	73.55	-6.27
General Industry	5.76*	5.98	-3.68	18.15	17.85	1.68
Retail Deliveries	3.74	3.90	-4.10	12.76	14.33	-10.96
Total Domestic Demand	77.49	80.99	-4.32	243.10	251.30	-3.26
Exports--Third-Part: Country	1.06	0.11	863.64	2.82	0.70	302.86
Total Demand	78.55*	81.09	-3.13	245.92	251.98	-2.40
Supply						
Domestic Production	61.50	62.07	-0.92	199.56	201.49	-0.96
Imports (Third-Party Countries)	18.59*	21.52	-13.62	-56.11	-61.58	-8.88
Total New Supply	80.09*	83.59	-4.19	255.67	263.07	-2.81
Stock Change	1.54	2.49	-	9.75	11.07	-

Totals may not add due to rounding
*Estimated

Sources: Eurostat
Chase Manhattan Bank

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The Coal Situation

A quarterly review from Energy Economics — The Chase Manhattan Bank, N.A., New York, N.Y. 10081

Vol. 2 – No. 4
SEPTEMBER, 1982

THE COMPETITIVE POSITION OF COAL FOR POWER GENERATION

In the spring of this year, OPEC was confronted with the greatest challenge to its ability to control world oil prices it has thus far had to face. Recession, improvements in energy efficiency, and energy substitution had decreased world oil demand. Simultaneously, increased oil production from non-OPEC producers, liquidation of oil inventories built up in 1980 and 1981, and OPEC's continued overproduction created excess supplies. This market imbalance led to a sharp decline in spot market oil prices which was followed by announced price reductions by non-OPEC producers, most notably Mexico and the United Kingdom.

As a result, OPEC was faced with the possibility of the collapse of its cartel because of price cutting as its members sought to recover market share. In response to the situation, it agreed to defend its official marker price through the control of production. By controlling supply, OPEC was gambling that the downward pressure on prices could be eased and that cash flow would improve during a post-recession recovery of the oil market. With the firming in spot market prices and announced price increases by the U.K. for North Sea crude, OPEC has regained some control. Nevertheless, spot prices for Middle East Light remain more than $2.70 a barrel below contract prices as of August 6, 1982. Thus, for OPEC, there are still clouds on the horizon.

What is still unclear is whether or not the hoped-for recovery in the oil market will be fast enough and strong enough to offset the internal political, social, and economic pressures being created by the lack of revenues OPEC needs to sustain the development plans of many of the member nations during the period of production control.

One problem which exacerbates this uncertainty is the Iran/Iraq war. Should the war end and both nations, in the attempt to repay their war debts, increase oil exports and sell their output at below official prices, OPEC would need to maintain production limits for a longer period of time, even with recovery in the oil market. The alternative would be a break in OPEC price unity, with each member attempting to increase market share by cutting prices. While we do not believe the latter outcome is highly likely, it is possible, particularly if the hoped-for improvement in world economies does not materialize. It is, in fact, possible that the Saudis will elect to reduce the price of Saudi Light in an effort to increase their revenues regardless of the Iran/Iraq situation. The possibility of further erosion of current dollar oil prices obviously has raised questions concerning the future attractiveness of coal.

The purpose of this issue of *The Coal Situation* is to examine the future economic position of coal relative to oil for electric power generation. Since the real concern is over falling oil prices, the following analysis addresses the question, "How low do delivered oil prices have to be in order to make use of coal a breakeven proposition with oil?" The answer is obtained by determining the real delivered price of oil that would be required to make the present value of the total annual cost of generating electricity by oil equal to the present value of the total annual cost of using coal. This determination is made based on our assumptions of the capital costs and non-fuel operating and maintenance expenses of the two fuel options and our assumption of the future average delivered price of coal. Since international coal trade is most sensitive to oil prices, this analysis concentrates on the major export coal markets of Europe and Japan.

Procedures

Working in constant 1981 dollars, the estimation of the "breakeven" price of oil is determined as follows:

- Calculate the life-of-plant present value of the non-fuel cost elements (i.e., capital and operation and maintenance expenses) of generating electricity for both coal-fired and oil-fired units.
- To the difference in the present value (coal minus oil) of the non-fuel costs of generation, add the present value of the cost of coal.
- Convert the total present value determined above to an annuity[1] which represents the levelized real cost of oil required for "breakeven" with the coal-fired facility.
- Using the oil unit's heat rate (BTUs needed to generate electricity) and the heat content of a barrel of residual oil, convert the "breakeven" cost determined above to a dollars-per-barrel delivered price of oil.

The result of the calculations outlined above is the breakeven delivered price of residual oil expressed as a real annuity over the life of the facility. A path of real oil prices which results in an annuity value below that determined in this analysis, that is below breakeven, means that the oil option would hold an economic advantage over coal. The reverse is true for real oil prices greater than those determined here.

Constant Relative Cost Case

We first explore the results of assuming that the relative costs of coal and oil-fired units do not change over time. Table 1 shows the base case assumptions used in calculating the breakeven annuity real price of oil for new power plant construction. The capital and non-fuel operating and maintenance expenses (O&M) refer to a facility having 1,200 megawatts of installed capacity consisting of two 600 megawatt units. The capital and operating costs for the coal-fired unit include allowances for a flue gas desulfurization system. The regional differences in the capital and operating costs between Europe and Japan reflect Japan's higher cost of land and stricter environmental standards.

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[1] The annuity represents a stream of equal annual payments over the life of the facility. The annuity is determined by dividing the present value by the sum of the real discount factors, i.e.,

$$\text{Annuity} = \text{Present Value} \div \sum_{n=1}^{N} \frac{1}{(1+d)^n}$$ where d = real discount rate.

TABLE 1

BASE CASE ASSUMPTIONS – NEW POWER PLANTS

(1981 Dollars)

	Europe		Japan	
	Coal	Oil	Coal	Oil
Capital dollars – $/KW	$1,100	780	1,175	800
Fixed O&M – $/KW/yr	28	5	35	6
Variable O&M – Mills/KWHR	1.4	0.5	1.4	0.5
Fuel Cost – $/MM BTU	2.56	6.00	2.69	6.50
Net Heat Rate – BTU/KWHR	10,000	9,500	10,000	9,500

Shown in Table 2 is the estimated levelized real (1981 $) cost of generating electricity based on the assumptions shown in Table 1. Levelized costs of generation are provided for three levels of power plant utilization, that is, the rate of operation of the facility (capacity factor). In both regions and at all three levels of plant operation, the new coal-fired facility enjoys a significant advantage over the costs of generating electricity from a new oil unit at existing fuel costs. For the per unit costs of the oil plant to equal the cost of generation at the coal plant, the real delivered cost of oil would have to be $3.66 per million BTUs ($23.10 per barrel) in Europe and $3.99 per million BTUs ($25.16 per barrel) in Japan under the 65 percent capacity factor case. In other words, the real delivered cost of residual oil would have to fall by 41 percent in Europe from the actual 1981 delivered price of $6.00 per million BTUs, and by 39 percent in Japan from its price of $6.50 per million BTUs. More important, prices would have to fall to these levels and stay there over the life of the facility in order to yield a breakeven situation.

TABLE 2

REAL LEVELIZED*

COST OF GENERATION IN MILLS PER KWHR

(1981 Dollars)

	Europe		Japan	
	Coal	Oil	Coal	Oil
Capacity Factor				
65%	46.7	68.9	50.3	74.1
55%	50.3	70.9	54.2	76.2
45%	55.5	73.9	60.0	79.3

*Based on a 6.5% real discount rate and 30-year life-of-plant.

Ignoring government taxes and other policies affecting end-use delivered prices, and assuming that the average wholesale price of low sulfur (1.5 percent or lower) residual oil maintains its historical ratio of 90 percent of the world average crude oil price, the breakeven delivered price of residual oil, at a 65 percent plant capacity factor, implies a world average crude oil price of $25.67 per barrel (1981 $). In short, when the decision is between coal and oil, the present $30 per barrel (1981 $) world average crude oil price would have to decline by an additional 15 percent and stay there, in real terms, to challenge the economic attractiveness of building coal-fired power plants to meet future electricity demand.

But the probability of the world average crude oil price reaching, and in fact falling below, $25.67 per barrel (1981 $) this year or next is high enough not to be ignored. Given the potential for increased oil demand resulting from economic recovery and lower real oil prices, the key question is, what is the likelihood of real oil prices remaining this low over the long term?

Before exploring the issue of long-term oil prices, it must be remembered that the breakeven prices outlined above are the result of the assumptions shown in Table 1. This represents a static condition in which the relative costs of the two fuel options remain unchanged and, therefore, does not account for potential increases in the cost of using coal.

Impact of Rising Real Costs of Coal

There are two potential areas of change affecting the long-term costs of coal-based power generation. First, construction and operating costs may increase as a result of the imposition of stricter pollution control standards in response to the environmental concerns. Second, the need to meet growing coal demand with new mines and new coal transportation and handling systems could produce higher real delivered coal prices. In the past few years, the international coal importer has experienced a significant increase in the real price he has had to pay for coal. While future real price increases are not expected to resemble recent history, modest real increases are a reasonable possibility.

We estimated the effects of these two areas of change on the breakeven price of oil for power generation based on the assumption that both capital requirements and delivered coal prices would escalate at a real rate of 1.0 percent per year. Table 3 shows the resulting breakeven real oil price. Real annuity prices are shown for facilities having in-service dates of 1985, 1990, 1995, and 2000. Also shown in the table are the breakeven prices that result under an assumed 6.5 percent real discount rate and a 10 percent real discount rate.

TABLE 3

REAL ANNUITY[1] DELIVERED RESIDUAL OIL PRICES

REQUIRED TO MAKE COAL A BREAKEVEN[2]

PROPOSITION FOR NEW ELECTRIC POWER PLANTS

AT A 65 PERCENT CAPACITY FACTOR

(1981 Dollars Per Barrel)

		Power Plant In-Service Date			
	Base[3]	1985	1990	1995	2000
Europe					
6.5% Real Discount Rate	23.10	26.29	27.85	29.43	31.11
10.0% Real Discount Rate	24.21	27.17	28.91	30.69	32.59
Japan					
6.5% Real Discount Rate	25.16	28.53	30.13	32.14	33.64
10.0% Real Discount Rate	26.45	29.60	31.40	33.74	35.33

1 Real 1981 prices levelized over the life of the facility.

2 Breakeven is defined as the present value of the total cost stream of generating electricity at a new oil-fired power plant being equal to the present value of the total cost stream of generating electricity by a new coal-fired power plant.

3 Excluding real relative cost increases for the cost of construction and cost of fuel at a coal-fired facility.

As a result of the assumption of increasing real costs of operating coal-fired power plants, the required real annuity price of oil over the life of the facility increases for those facilities having a future in-service date. For instance, in Europe under the 6.5 percent discount rate scenario, new oil-fired facilities having an in-service date of 1990 would require a real levelized delivered price of oil of $27.85 (1981 $) for breakeven with a coal-fired unit with the same in-service date. For new units with an in-service date of 2000, in Europe this levelized breakeven real price of oil increases to $31.11 per barrel (1981 $), assuming a 6.5 percent real discount rate.

Maintaining the previous assumption concerning the ratio of residual oil to world average crude oil prices, Table 4 shows an estimated world average crude oil price stream (1981 $) that would produce the breakeven delivered price of residual oil shown in Table 3. The price stream shown here differs from the prices shown in Table 3 in that it represents just one of many possible streams for the average world crude oil prices that produce the levelized annuity prices of residual oil shown previously. It is important to remember that an annuity represents a *levelized* cost stream over the life of the facility. While an infinite number of yearly price paths could be developed which would produce the levelized real annuities

shown in Table 3, the one shown here was developed based on the arbitrary assumption of breakeven between oil and coal in every year.

TABLE 4

WORLD AVERAGE CRUDE OIL PRICE STREAM PRODUCING BREAKEVEN RESIDUAL OIL PRICES

(1981 Dollars Per Barrel)

	Actual		Estimate			
	1981	1st Half 1982	1985	1990	1995	2000
Real Discount Rate						
6.5%	34.63	31.48	26.86	28.46	30.10	31.85
10.0%	34.63	31.48	28.25	30.07	31.95	33.94

Given the figures shown in Table 4, for a 6.5 percent discount rate, the world average real price of crude oil would have to fall by 15 percent from present levels and increase only modestly (1.1 percentage points per year) throughout the forecast period, to approximate breakeven with new coal-fired power generation. As stated previously, real crude oil prices (1981 $) are expected to decline as a result of current market conditions.

Nevertheless, to us it seems unlikely that falling real oil prices will significantly affect the construction schedules of new power plant additions over the next four to five years. Based on the consumer's past experiences with oil prices, the oil outlook would have to indicate a clear economic advantage over a sustained period of time to instill confidence and change the perception of future oil price risk. In short, it would seem that oil prices below those shown in Table 4 would have to exist for some time to provide the incentive to alter construction patterns.

Furthermore, it is doubtful that such an incentive could be maintained over an extended period. This is because there would be an eventual shift from the emphasis on constructing new coal-fired power plants to the construction of oil-fired units. The resulting increase in the demand for oil would, in turn, exert upward pressure on the oil supply/demand balances, leading to a higher equilibrium price of oil. Since the prices shown in Table 4 represent the indifference point for the utility's selection between coal and oil units, the prices shown here provide an indication as to the floor in the long-term trend in real crude oil prices. While market conditions can produce lower prices for short periods of time, the relative cost position of coal versus oil-fired power generation developed here suggests that the predictions of the eventual collapse of OPEC leading to long-term real crude oil prices below $20 a barrel are unlikely. In the World Outside Communist Areas (WOCA), the crude oil equivalent of 10 million barrels per day of coal was used to generate electric power in 1980.

Thus regarding the outlook for coal-based power generation in Europe and Japan, our conclusion is still positive. While falling oil prices will stall and eliminate some of the conversion of existing oil-fired facilities for which the breakeven price of oil is significantly higher than shown here for new power plants, growth opportunities continue to exist for new coal-fired construction. In the short term, the perceived risks of oil price instability support this conclusion even if oil prices fall below those shown in Table 4. If the long-run real price of crude oil approximates the price trend shown in Table 4, then there will be a sharing between oil and coal for new power plant construction. In the long run, however, we must recognize that the equilibrium price of crude oil will be more heavily influenced by the premium fuel markets, such as home heating, transportation, and petrochemical feedstocks. The substitute fuels in these markets will, in general, involve higher costs than oil. Therefore, the demand for oil in the premium fuel markets could produce a higher long-run equilibrium price for crude oil which would support the continued greater emphasis on coal use for power generation.

These conclusions are based solely on the competition between oil and coal for power generation. Left out of the equation is nuclear-based energy. Nuclear energy provides the cheapest source of new power generation for base-loaded power plants in the regions analyzed here and, therefore, will continue to be the fastest growing source of electricity production. Nuclear-based power generation, however, has its own set of social, political, and economic risks which in our view negate its ability to capture the entire market.

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UNITED STATES COAL BALANCES

	OCT. THRU DEC.			CALENDAR YEAR TO DATE		
	1981	1980	CHANGE	1981	1980	CHANGE
	Million Short Tons		– % –	Million Short Tons		– % –
Consumption						
Electric Utilities	147.93	141.95	4.21	596.80	569.28	4.83
Coking Plants	15.04	15.61	–3.65	60.98	66.67	–8.53
General Industry	16.21	16.39	–1.10	64.40	60.35	6.71
Retail Deliveries	2.39	2.00	19.50	6.85	6.45	6.20
Total Domestic Demand	181.56	175.94	3.19	729.02	702.74	3.74
Exports	35.77	26.67	34.12	112.55	91.74	22.68
Total Demand	217.33	202.61	7.27	841.56	794.48	5.93
Supply						
Domestic Production	236.05	213.06	10.79	820.14	829.70	–1.15
Imports	0.30	0.21	42.86	1.05	1.19	–11.76
Total New Supply	236.35	213.27	10.82	821.18	830.89	–1.17
Stock Change	19.02	10.67	–	–20.38	36.43	–

Totals may not add due to rounding

Sources: U. S. Department of Energy
National Coal Association
Chase Manhattan Bank

EUROPEAN ECONOMIC COMMUNITY COAL BALANCES – HARD COAL

	------OCT. THRU DEC.------			– CALENDAR YEAR TO DATE –		
	1981	1980	CHANGE	1981	1980	CHANGE
	Million Short Tons		–%–	Million Short Tons		–%–
Deliveries to:						
Electric Utilities	51.62	51.94	–0.62	194.52	197.50	–1.51
Coke Plants	24.02	23.49	2.26	92.68	97.04	–4.49
General Industry	6.99*	7.12	–1.83	25.37	24.97	1.60
Retail Deliveries	4.94*	5.47	–9.69	17.79	19.80	–10.15
Total Domestic Demand	87.57	88.02	–0.51	330.35	339.32	–2.64
Exports	1.14	0.25	356.00	4.00	0.95	321.05
Total Demand	88.71*	88.27	0.50	334.35	340.25	–1.73
Supply						
Domestic Production	71.19	70.52	0.95	270.73	272.01	–0.47
Imports (Third–Party Countries)	19.88	19.18	3.65	76.02	80.76	–5.82
Total New Supply	91.07	89.70	1.53	346.76	352.77	–1.70
Stock Change	2.36	1.43	–	12.41	12.50	–

Totals may not add due to rounding
* Estimated

Sources: *Eurostat*
Chase Manhattan Bank

CHASE